

## THE VARIETIES OF GREWIA CARPINIFOLIA JUSS. (TILIACEÆ)

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ABSTRACT : Three varieties have been described within *Grewia carpinifolia*, but have not been accepted in recent treatments of the species. Morphological, distributional and ecological data are adduced to show that the varieties : var. *carpinifolia*, var. *rowlandii* (K. Schum.) Burret and var. *hierniana* Burret are, in fact, distinct, and a key is provided for their determination.

RÉSUMÉ : Trois variétés ont été décrites au sein de *Grewia carpinifolia*, mais n'ont pas été acceptées dans les traitements récents de cette espèce. Quelques données morphologiques, phytogéographiques et écologiques sont utilisées afin de montrer que ces variétés : var. *carpinifolia*, var. *rowlandii* (K. Schum.) Burret et var. *hierniana* Burret sont vraiment distinctes; une clé pour leur détermination est proposée.

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*Grewia carpinifolia* is a woody climber which occurs in dry forest from Sierra Leone to Cameroun and São Tomé, and also from near the mouth of the Congo River in Zaïre southwards into Angola. BURRET (1910) in his account of African *Grewia*, recognised three varieties within *G. carpinifolia*: var. *carpinifolia*, var. *rowlandii* (K. Schum.) Burret and var. *hierniana* Burret. None of the three authors of floras which have dealt with this species: i.e. KEAY (1954), EXELL & MENDONÇA (1957), and WILCZEK (1963), have maintained these varieties. It is the purpose of this paper to show that the varieties are, in fact, quite distinct, both morphologically and in distribution (fig. 1), and worthy of recognition.

### *Grewia carpinifolia* Jussieu

Ann. Mus. Paris 4 : 91 (1804).

— *Vinticina carpinifolia* (Juss.) BURRET, Notizbl. Bot. Gard. Berl. 12 : 715 (1935).

TYPE : Palisot de Beauvois s. n., Ghana (holo-, P).

Liane to 20 m long in forest, stem to 10 cm diam., becoming deeply cleft into 3-4 laterally flattened lobes, which may separate as the centre rots; in disturbed thicket or farm bush it forms a scrambling shrub. Leaves elliptic, obovate or oblong, subcordate, truncate or rounded at the base; rounded to acuminate at the apex, serrate, glabrous to more or less stellate-pubescent or scabrid, especially on the lower surface, (5-) 7-9 (-12) cm long, 2-4 (-5) cm wide; petiole 3-7 mm long, pubescent; stipules entire, lanceolate,

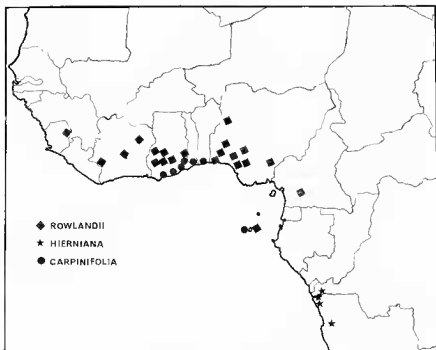


Fig. 1. — Global distribution of *Grewia carpinifolia*.

caducous. Cymes axillary, 1-3-flowered. Buds oblong, broader at the base. Sepals green, oblong, 10-15 mm long, densely pubescent on outside, glabrous within; petals yellow, oblong, 8-14 mm long, limb notched at apex and longer than basal glandular part; stamens yellow. Androgynophore (disk) infundibuliform or patelliform, glabrous or ciliate. Ovary 1-4-locular, densely pubescent; style cylindrical, glabrous, with 4-lobed stigma. Drupe dark orange when ripe, globose or shallowly 2-lobed, 5-12 mm diam., containing 1-4 pyrenes.

#### 1. var. *carpinifolia*

The type sheet of *Grewia carpinifolia*, *Palisot de Beauvois s.n.*, is labelled 'Oware', thus indicating its place of collection as Warri in southern Nigeria. This specimen has leaves which are subcordate to cordate at the base and obtuse to subacuminate at the apex, inflorescences with short peduncles and pedicels, and fruits which are spherical and unlobed. Plants with this combination of characters have never subsequently been collected in Nigeria. KEAY (1954) discusses the similar case of the type specimen of *Grewia megalocarpa* Juss., also collected by BEAUVOIS and labelled

'Oware', and concludes that it must have come, in fact, from coastal scrub in Ghana, where it is endemic. It is known that BEAUVOIS collected at Shama, a Ghanaian coastal fishing village at the mouth of River Pra, 13 km north-east of Sekondi: HEPPER (1968) cites the BEAUVOIS type specimen of *Culcasia scandens* Pal. Beauv. as originating from Shama. Both *G. megalocarpa* and the typical form of *G. carpinifolia* occur close to Shama, so it is reasonable to assume that this is the type locality for both. The annotations on BEAUVOIS' specimens are, in any case, notoriously unreliable (KEAY, ONOCHIE & STANFIELD, 1960).

MATERIAL EXAMINED: GHANA: *Beauvois s.n.*, ? Shama, P; *Vogel 67*, Cape Coast, K; *Don s.n.*, Cape Coast, K; *Chipp 172*, Princetown, K; *Cummins 12*, Manso, K; *Lloyd Williams 300*, Aburi, K, GC; *Ankrah GC 20038*, ARS Nungua, K, GC; *Brown 395*, Aburi, K; *Joluson 900*, Obosomase, K, GC; *Datzel 61*, Accra, K; *Lovi WACRI 3840*,

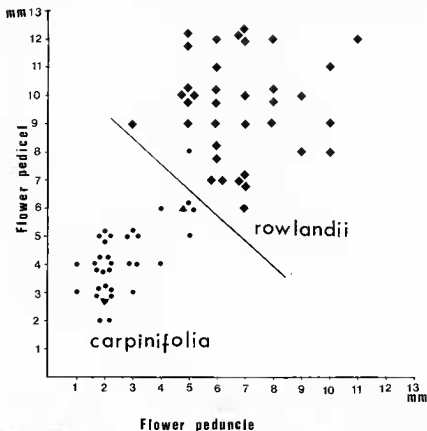


Fig. 2. — Scatter diagram showing maximum pedicel length plotted against maximum peduncle length for flowering specimens of *Grewia carpinifolia* with ciliate disk; ● : leaf base subcordate, apex subacuminate; ◆ : leaf base rounded, apex acuminate; ▼ : leaf base rounded, apex subacuminate; ▲ : leaf base subcordate, apex acuminate.

Dodowa, K; *Deighton* 602, Accra, K; *Akpala* 58, Achimota Forest Reserve, K, GC; *Morton* A1592, Legon, K, GC; 7257, Anyaboni, K, GC; 7855, Nungua, K, GC; 8085, Shai Hills, K, GC; 7721, Aburi to Nsawam, K, GC; 7936, Asikuma, K, GC; 9211, Senya Beraku, K; A4201, Mankrong, K, GC; *Irvine* 20, Accra Plains, K; *Obeng-Darko* WACRI 1020, Winneba Plains, K; 1028, Anomabo, K; 1035, Yamoransa, K; 1029, Saltpond, K; *Leeuwenberg* 11151, Shama, WAG, GC; *Siaw & Hall* GC 46179, Adukrom, GC; GC 46174, Huhunya, GC; *Hail & Enti* GC 42748, Agoe, GC; *Rodenburg* 40, Kpandu, L, GC; 41, Kudzra, L, GC; *Goodall* 15505, Adentan, GC; *Adams* 4787, Ajena, GC. — TOGO : *Warnecke* 34, Lomé, K; 374, Lomé, K; *Mildbraed* 7480, Lomé, K. — DAHOMEY : *Debeaux* 351, Cotonou, K; 391, Cotonou, K. — SAO TOMÉ : *Don s.n.*, K.

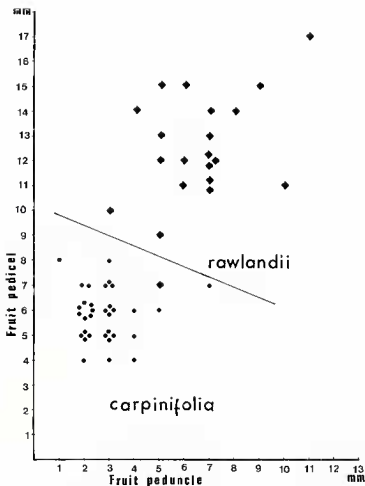


Fig. 3. — Scatter diagram showing maximum pedicel length plotted against maximum peduncle length for fruiting specimens of *Grewia carpiniifolia* with ciliate disk; ● none of fruits lobed; ◆ at least some fruits 2-lobed.

2. var. *rowlandii* (K. Schum.) Burret

Bot. Jahrb. 45 : 168 (1910).

— *Grewia rowlandii* K. SCHUM., Bot. Jahrb. 33 : 306 (1904).

NEOTYPE : *Millen 44*, K.

In describing *Grewia rowlandii* K. SCHUMANN suspected it to be related to *G. carpinifolia* and possibly conspecific, but stated that he had not seen the type of *G. carpinifolia* and therefore could not be sure. BURRET (1910) reduced *G. rowlandii* to *G. carpinifolia* var. *rowlandii*, distinguishing it from the typical variety by its "längeren, feinen, dünnen Pedunculi und Pedicelli".

The syntypes of *G. rowlandii* are *Rowland s.n.* from West Lagos, and *Buchner s.n.* from Accra. As all the abundant material of *G. carpinifolia* collected near Accra corresponds to var. *carpinifolia* rather than to var. *rowlandii*, it is reasonable to assume that *Buchner s.n.* was in fact var. *carpinifolia*. I therefore choose *Rowland s.n.* as lectotype of *G. rowlandii*. There is no duplicate material at Kew of either syntype, and the originals may be presumed to have been destroyed in Berlin (ZEPERNICK, pers. comm.); it is therefore necessary to choose a neotype. I have selected *Millen 44* as neotype of *G. rowlandii*: it has the characteristics used by BURRET (1910) to distinguish var. *rowlandii* from var. *carpinifolia*; it was collected from Lagos, as was the lectotype; it is represented at Kew by good, abundant material. *Don s.n.* from São Tomé, cited by BURRET as var. *rowlandii* is in fact var. *carpinifolia*.

Preliminary observations in Ghana indicated the existence of two well marked varieties, corresponding to var. *carpinifolia* and var. *rowlandii*, and differing in several characters additional to those noted by BURRET. The variety with longer peduncles and pedicels, i.e. var. *rowlandii*, appeared to have leaves which are rounded (not subcordate) at the base, acuminate (not subacuminate or rounded) at the apex, glabrous (not scabrid-pubescent) on the upper surface and sparsely (not densely) pubescent below. Its fruits are usually distinctly lobed (not spherical); this character is more readily seen in fresh material, but can also be seen in herbarium specimens despite wrinkling of the pericarp. The two varieties have in common, however, an infundibuliform ciliate disk (despite the statement of SCHUMANN (1904) that the disk is glabrous in *G. rowlandii*).

To test the tentative conclusion that two distinct varieties may be distinguished within *G. carpinifolia* using the above characters, all the material of *G. carpinifolia* in the Kew and Ghana Herbaria was assessed for leaf shape and pubescence, maximum peduncle and pedicel length in flower and/or fruit, and presence of fruit lobing. Figs. 2 and 3 show that both flowering and fruiting specimens with ciliate disk are divided by these characters between the two varieties *carpinifolia* and *rowlandii* with hardly any intermediates. Table I shows the distribution of lobing and pyrene number in fruits of the two varieties.

Fig. 4 shows that the two varieties differ in their ecological preferences; var. *carpinifolia* predominates in South-east Outlier forest (mean annual

TABLE 1 : VARIATION IN THE NUMBER OF LOBES AND PYRENES IN 100 RANDOMLY SELECTED MATURED FRUITS IN ONE GHANAIAIN POPULATION OF EACH VARIETY (FROM SIAW, 1978)

VARIETY (Population Locality)	NUMBER OF LOBES	NUMBER OF PYRENES				TOTAL
		1	2	3	4	
var. <i>carpinifolia</i> (Legon)	1	36	29	21	14	100
var. <i>rowlandii</i> (Mensah Dawa)	1	28	7	2	0	37
	2	0	21	24	18	63

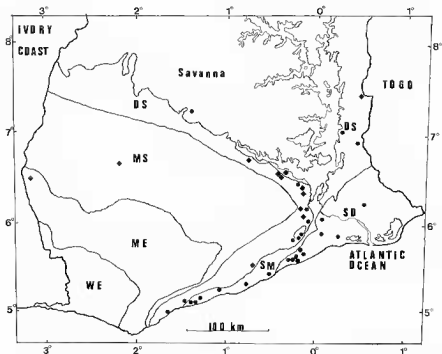


Fig. 4. — Map of southern Ghana showing distribution of *Grewia carpinifolia* var. *carpinifolia* (●) and var. *rowlandii* (◆) in relation to the forest-types described by HALL & SWAINE (1976). Abbreviations for forest-types (in order from drier to wetter): SO, South-east Outlier; SM, Southern Marginal; DS, Dry Semi-deciduous; MS, Moist Semi-deciduous; ME, Moist Evergreen; WE, Wet Evergreen.

rainfall 750-1000 mm) and Southern Marginal forest (mean annual rainfall, 1000-1250 mm), whereas var. *rowlandii* predominates in Dry Semi-deciduous forest (mean annual rainfall 1250-1500 mm). The scattered localities for var. *rowlandii* in Moist Semi-deciduous and Moist Evergreen forest are in shallow soil on outcropping rock.

From fig. 5 it can be seen that var. *rowlandii* is strongly seasonal; almost all the records of flowering are from March to May, and of fruiting from August to October (though a few fruits may persist on the plant until the next flowering season). Var. *carpinifolia*, on the other hand, has been collected in flower and in fruit in every month of the year, though phenological activity peaks in the early part of the main rainy season (March-May) and in the small rainy season (October-November).

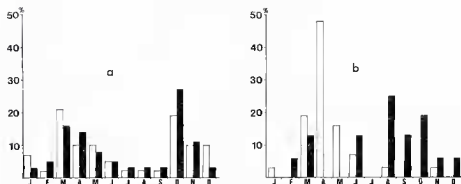


Fig. 5. — Flowering (open columns) and fruiting (solid columns) in (a) var. *carpinifolia* and (b) var. *rowlandii*. Data derived from the following totals of herbarium specimens : var. *carpinifolia* flowering 42, fruiting 37; var. *rowlandii* flowering 31, fruiting 16. Each bar represents the sum of records for that month expressed as a percentage of the relevant total of specimens.

It seems probable that the geographically widespread var. *rowlandii* represents the ancestral form of the species, whereas the more restricted var. *carpinifolia* is a derivative which has become adapted to the lower and more erratic rainfall regime of the coastal parts of the Dahomey Gap (WHITE, 1979).

MATERIAL EXAMINED : SIERRA LEONE : Morton & Gledhill SL 1806, Konclo, K, GC. — IVORY COAST : Leeuwenberg 3319, Tiébissou, K, WAG, GC; Bokdam 2776, Lamto Reserve, K; Geerling & Bokdam 2560, Gansé, GC; Boughey 14716, Guiglo, GC. — GHANA : Fishlock 7, Assuantsi, K; Attafuah WACRI 5063, Ejura to Nkoranza, K; Thomas D180, Bomase, K, GC; Vigne FH 1097, Kumasi, K; 1910, Ofin Headwaters Forest Reserve, K; Johnson 909, Abefifi, K, GC; Kitson 1136, Dedesu to Worobong, K; Obeng-Darko 5003, Kwadaso, K; Morton A243 & 7829, Asafo, K, GC; A636, Kwahu Tafo to Mankrong, K, GC; Hall & Agyakwa GC 39687, Abowom, K, GC; Beveridge FH 4200, Northern Scarp West Forest Reserve, K; Obeng-Darko 1047, Wenchi, K; Morton A3391, Nyinahin Range, GC; Martin GC 47031, Bia National Park, GC; Gati 31, Jasikan, GC; Stav & Hall GC 46171, Mensah Dawa, K, GC; 46178, Adukrom to Koforidua, K, GC. — DAHOMEY : Le Testu 285, K. — NIGERIA : Thomas 1700, K; Wit FHI 66914, Ifon to Uzebba, K; Gledhill 947, Idanre, K; Meikle 1471, Ibadan, K; Lowe UIH 11655, Benin, K; Millson s.n., Oshugbo, K; Millen 177, Gilite to Addo, K; 44, Lagos, K; Okon FHI 22756, Akeke, K; Keay FHI 16207, Gambari, K; Onochie FHI 23375, Ewohimi, K; Latto FHI 34014, Acharane Forest Reserve, K; Binuyo FHI 41366, Iyamoyong Forest Reserve, K; Cook 497, Shagunu, K. — CAMEROON : De Wilde 1358 & 2300, Yaoundé, K. — SAO TOMÉ : Moller 39, K.

3. var. *hierniana* Burret

Bot. Jahrb. 45 : 168 (1910).

TYPE : *Welwitsch 1369 pro parte*, Angola (holo-, K).

BURRET (1910) distinguished this variety from var. *carpinifolia* on leaf characters: shape rather narrowly oblong rather than ovate-elliptic, base rounded rather than cordate, and apex longer acuminate. He stated that the peduncles, pedicels and flowers do not differ from those of the type. In fact the leaf base in the Angolan type specimen (*Welwitsch 1369 p.p.*) is subcordate, and the acuminate apex also occurs in var. *rowlandii*. The lengths of peduncles and pedicels are within the range of var. *carpinifolia*. On the basis of the characters used by BURRET, therefore, this variety appears to be almost exactly intermediate between var. *carpinifolia* and var. *rowlandii* and to provide grounds for not recognising any of them. BURRET, however, overlooked the fact that the disk (i.e. androgynophore) in the type of var. *hierniana* is patelliform, about 2.5 times wider than long, and glabrous on the margin, whereas the disk in the type of var. *carpinifolia* is infundibuliform, about 1.8 times wider than long and ciliate on the margin. WILCZEK (1963) uses one of these characters in his key to *Grewia* species, distinguishing *G. carpinifolia* and *G. rugosifolia* De Wild. with a glabrous disk from *G. flavescens* Juss. and *G. forbesii* Harv. ex Mast. with a ciliate disk. His characterisation of the disk of *G. carpinifolia* as glabrous must have been based only on the examination of specimens of var. *hierniana* from Zaire or Angola; it is inapplicable to the other varieties.

MATERIAL EXAMINED : ZAIRE : *Vermoesen 2597*, Banane, K; *Dacremont 142*, Boma, K. — ANGOLA : *Welwitsch 1369*, K; *Dawe 36*, Lunuango, K; *6727*, K; *Gossweiler s.n.*, Mussenga de Luanda, K; *9977*, Cuanza Sul, Amboim, K.

KEY TO THE VARIETIES OF GREWIA CARPINIFOLIA

1. Disk (i.e. androgynophore) infundibuliform, 1-1.8 times as wide as long, ciliate on the margin; leaves elliptic to obovate.
2. Leaves subacuminate to rounded at apex, subcordate (rarely rounded) at base, more or less scabrid-pubescent on both surfaces (though more densely so underneath); peduncle 1-4(-6) mm in flower and fruit; pedicel 2-5(-6) mm long in flower, 4-7(-8) mm long in fruit; fruit spherical; Ghana to Dahomey and São Tomé. . . . . 1. var. *carpinifolia*
- 2'. Leaves acuminate at apex, rounded (rarely subcordate) at the base, glabrous (or rarely with a few sparse hairs) on upper surface, sparsely pubescent below; peduncle (3-)5-8(-11) mm long in flower and fruit; pedicel 7-12 mm long in flower, (7-)11-15(-17) mm long in fruit; fruit usually distinctly 2-lobed; Sierra Leone to Cameroun and São Tomé . . . . . 2. var. *rowlandii*
- 1'. Disk patelliform, 2.5-3.5 times as wide as long, completely glabrous; leaves more or less oblong, acuminate (or rarely subacuminate), rounded to subcordate at base, glabrous or pubescent on upper surface; peduncle 2-3 (-5) mm long; pedicel 5-8 mm; fruit often lobed; Zaire and Angola . . . . . 3. var. *hierniana*



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